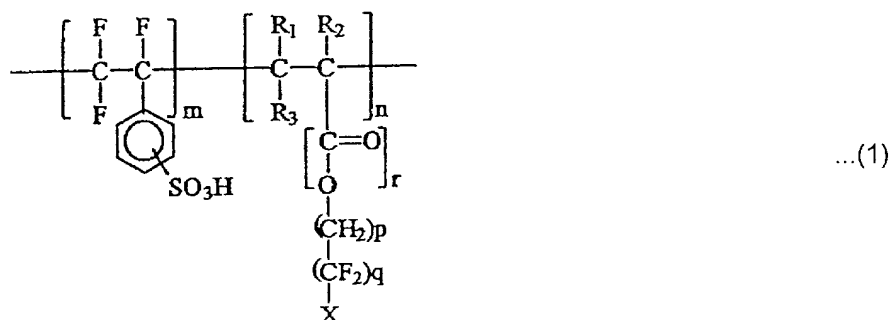


What is claimed is:

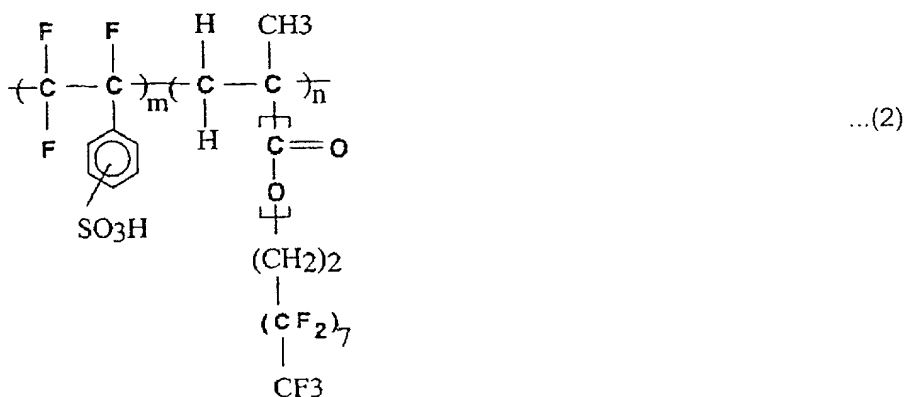
1. A partially fluorinated copolymer having formula (1):



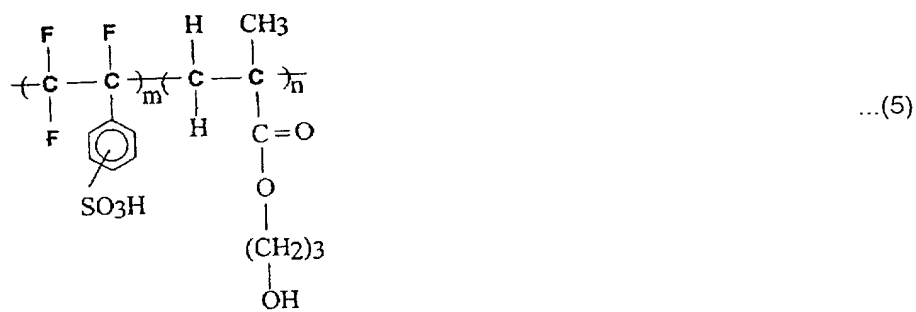
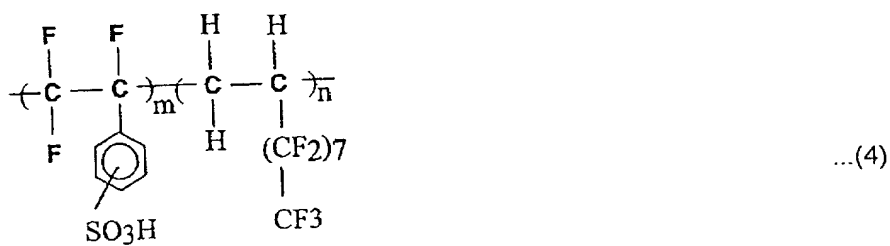
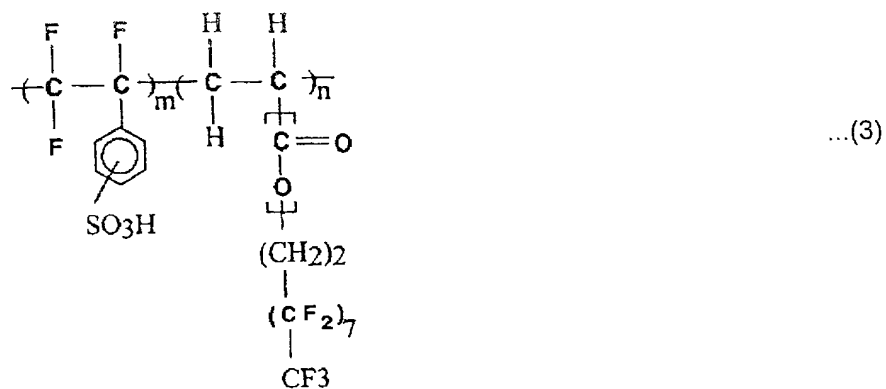
wherein each of R₁, R₂ and R₃ independently is selected from the group consisting of F, H and CH₃; X is a hydroxy group or a trifluoromethyl group; m is an integer greater than zero; n is an integer greater than zero; and p, q and r are zero or integers greater than zero.

2. The partially fluorinated copolymer of claim 1, wherein, in formula (1), m is an integer from 1 to 50, n is an integer from 1 to 50; p is zero or an integer from 1 to 12; and q is zero or an integer from 1 to 12.

3. The partially fluorinated copolymer of claim 1, wherein the partially fluorinated copolymer having formula (1) is a compound having one selected from formulas (2) to (5):



a) H_2O		b) $\text{H}_2\text{O} + \text{H}_2\text{O}_2$		c) $\text{H}_2\text{O} + \text{H}_2\text{O}_2 + \text{H}_2\text{O}_2$		d) $\text{H}_2\text{O} + \text{H}_2\text{O}_2 + \text{H}_2\text{O}_2 + \text{H}_2\text{O}_2$	
Time (h)	Conc. (M)	Time (h)	Conc. (M)	Time (h)	Conc. (M)	Time (h)	Conc. (M)
0	0.00	0	0.00	0	0.00	0	0.00
1	0.01	1	0.01	1	0.01	1	0.01
2	0.02	2	0.02	2	0.02	2	0.02
3	0.03	3	0.03	3	0.03	3	0.03
4	0.04	4	0.04	4	0.04	4	0.04
5	0.05	5	0.05	5	0.05	5	0.05
6	0.06	6	0.06	6	0.06	6	0.06
7	0.07	7	0.07	7	0.07	7	0.07
8	0.08	8	0.08	8	0.08	8	0.08
9	0.09	9	0.09	9	0.09	9	0.09
10	0.10	10	0.10	10	0.10	10	0.10
11	0.11	11	0.11	11	0.11	11	0.11
12	0.12	12	0.12	12	0.12	12	0.12
13	0.13	13	0.13	13	0.13	13	0.13
14	0.14	14	0.14	14	0.14	14	0.14
15	0.15	15	0.15	15	0.15	15	0.15
16	0.16	16	0.16	16	0.16	16	0.16
17	0.17	17	0.17	17	0.17	17	0.17
18	0.18	18	0.18	18	0.18	18	0.18
19	0.19	19	0.19	19	0.19	19	0.19
20	0.20	20	0.20	20	0.20	20	0.20
21	0.21	21	0.21	21	0.21	21	0.21
22	0.22	22	0.22	22	0.22	22	0.22
23	0.23	23	0.23	23	0.23	23	0.23
24	0.24	24	0.24	24	0.24	24	0.24
25	0.25	25	0.25	25	0.25	25	0.25
26	0.26	26	0.26	26	0.26	26	0.26
27	0.27	27	0.27	27	0.27	27	0.27
28	0.28	28	0.28	28	0.28	28	0.28
29	0.29	29	0.29	29	0.29	29	0.29
30	0.30	30	0.30	30	0.30	30	0.30
31	0.31	31	0.31	31	0.31	31	0.31
32	0.32	32	0.32	32	0.32	32	0.32
33	0.33	33	0.33	33	0.33	33	0.33
34	0.34	34	0.34	34	0.34	34	0.34
35	0.35	35	0.35	35	0.35	35	0.35
36	0.36	36	0.36	36	0.36	36	0.36
37	0.37	37	0.37	37	0.37	37	0.37
38	0.38	38	0.38	38	0.38	38	0.38
39	0.39	39	0.39	39	0.39	39	0.39
40	0.40	40	0.40	40	0.40	40	0.40
41	0.41	41	0.41	41	0.41	41	0.41
42	0.42	42	0.42	42	0.42	42	0.42
43	0.43	43	0.43	43	0.43	43	0.43
44	0.44	44	0.44	44	0.44	44	0.44
45	0.45	45	0.45	45	0.45	45	0.45
46	0.46	46	0.46	46	0.46	46	0.46
47	0.47	47	0.47	47	0.47	47	0.47
48	0.48	48	0.48	48	0.48		



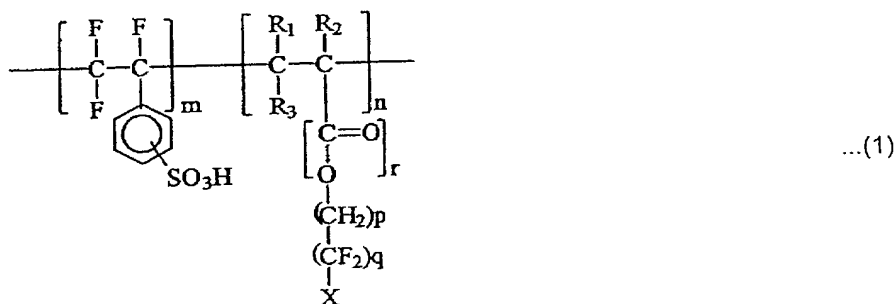
where m is an integer from 1 to 50; and n is an integer from 1 to 50.

4. The partially fluorinated copolymer of claim 1, wherein the partially fluorinated copolymer having formula (1) has a weight average molecular weight of about 30,000 to about 500,000.

5. The partially fluorinated copolymer of claim 1, wherein the partially fluorinated copolymer is partially crosslinked using a crosslinking agent.

6. The partially fluorinated copolymer of claim 5, wherein the crosslinking agent comprises at least one selected from the group consisting of divinyl benzene, diallyl ether, triallyl ether, diglycidyl ether and ethylene glycol dimethacrylate.

7. An ionic conductive polymer membrane comprising a partially fluorinated copolymer having formula (1):

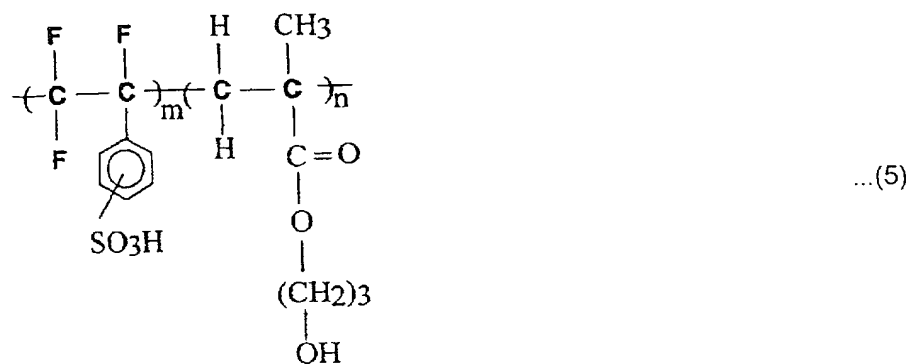
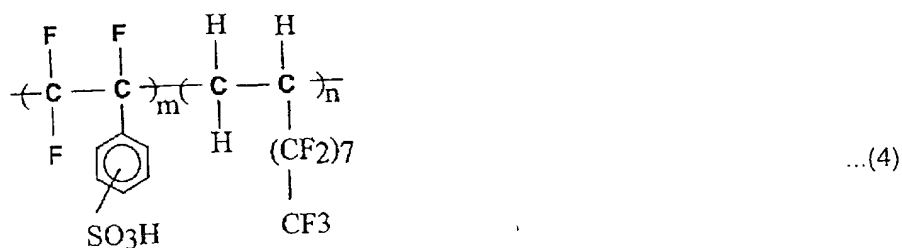
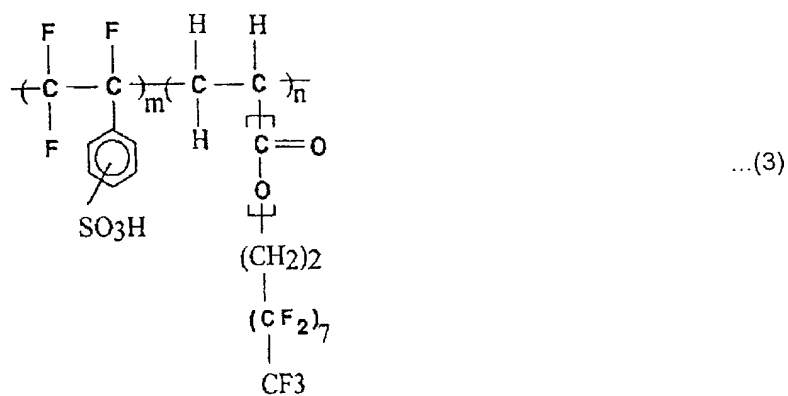
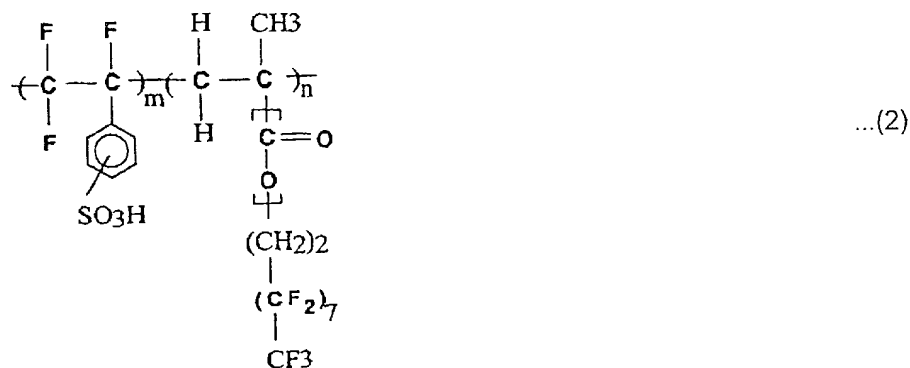


wherein each of R_1 , R_2 and R_3 independently is selected from the group consisting of F, H and CH_3 ; X is a hydroxy group or a trifluoromethyl group; m is an integer greater than zero; n is an integer greater than zero; and p , q and r are zero or integers greater than zero.

8. The ionic conductive polymer membrane of claim 7, wherein, in formula (1), m is an integer from 1 to 50, n is an integer from 1 to 50; p is zero or an integer from 1 to 12; and q is zero or an integer from 1 to 12.

9. The ionic conductive polymer membrane of claim 7, wherein the

partially fluorinated copolymer having formula (1) is a compound having one selected from formulas (2) to (5):



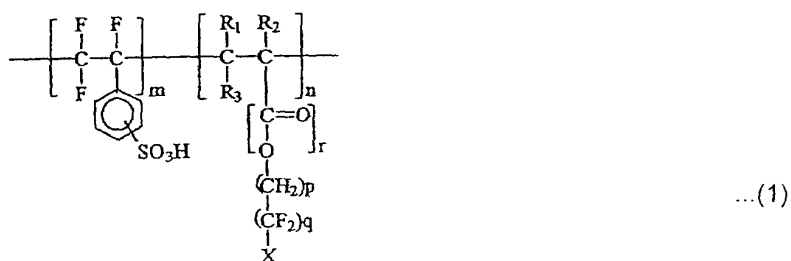
where m is an integer from 1 to 50; and n is an integer from 1 to 50.

10. The ionic conductive polymer membrane of claim 7, wherein the partially fluorinated copolymer having formula (1) has a weight average molecular weight of about 30,000 to about 500,000.

11. The ionic conductive polymer membrane of claim 7, wherein the partially fluorinated copolymer is partially crosslinked using a crosslinking agent.

12. The ionic conductive polymer membrane of claim 5, wherein the crosslinking agent comprises at least one selected from the group consisting of divinyl benzene, diallyl ether, triallyl ether, diglycidyl ether and ethylene glycol dimethacrylate.

13. A fuel cell comprising an ionic conductive layer, the layer comprising a partially fluorinated copolymer having formula (1):

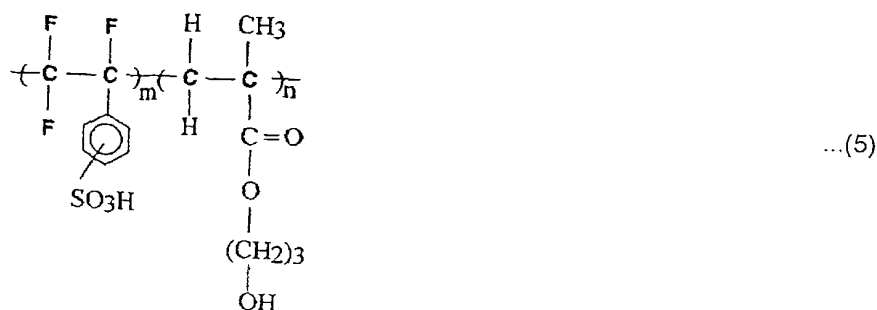
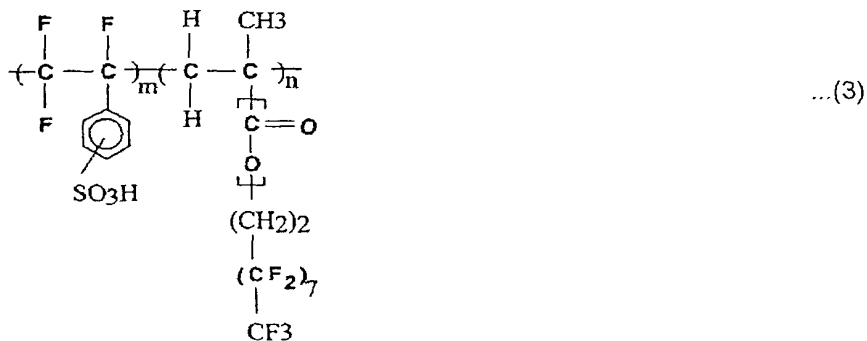
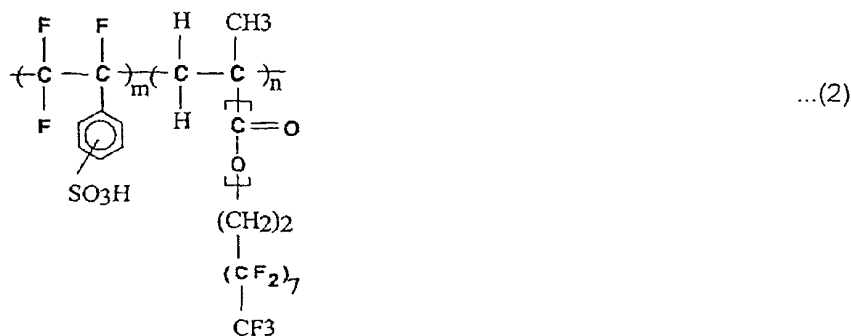


wherein each of R_1 , R_2 and R_3 independently is selected from the group consisting of F, H and CH_3 ; X is a hydroxy group or a trifluoromethyl group; m is an integer greater than zero; n is an integer greater than zero; and p , q and r are zero or integers greater than zero.

14. The fuel cell of claim 13, wherein, in formula (1), m is an integer from 1

to 50, n is an integer from 1 to 50; p is zero or an integer from 1 to 12; and q is zero or an integer from 1 to 12.

15. The fuel cell of claim 13, wherein the partially fluorinated copolymer having formula (1) is a compound having one selected from formulas (2) to (5):



34
35
36
37
38
39
40
41

where m is an integer from 1 to 50; and n is an integer from 1 to 50.

1
2
3

16. The fuel cell of claim 13, wherein the partially fluorinated copolymer having formula (1) has a weight average molecular weight of about 30,000 to about 500,000.

1
2

17. The fuel cell of claim 13, wherein the partially fluorinated copolymer is partially crosslinked using a crosslinking agent.

1
2
3
4

18. The fuel cell of claim 17, wherein the crosslinking agent comprises at least one selected from the group consisting of divinyl benzene, diallyl ether, triallyl ether, diglycidyl ether and ethylene glycol dimethacrylate.